WHAT IS CLAIMED IS

1. A current sensor using a Sagnac interferometer including a light source, an optical directional coupler on which light from the light source impinges, a first polarization filter on which light emitted from the optical directional coupler impinges and which emits a given linearly polarized light, a second optical branch unit for branching light emitted from the first polarization filter into two beams, an optical phase modulator connected to one branch end of the second optical branch unit, a current sensing coil on which light from the other branch end of the second optical branch unit and light from the optical phase modulator impinge as levorotatory light and dextrorotatory light, a first quarter-wave plate inserted between the optical phase modulator and the current sensing coil, and a second quarter-wave plate inserted between the other branch end of the second optical branch unit and the current sensing coil;

further comprising a first depolarizer inserted between the optical directional coupler and the first polarization filter.

2. A current sensor using a sagnac interferometer according to Claim 1, further comprising a second depolarizer and a second polarization filter connected in series between the optical phase modulator and the first quarter-wave plate; and a third depolarizer and a third polarization filter connected in series between the other branch end of the second optical branch unit and the second quarter-wave plate, the second depolarizer being connected to the optical phase modulator side and the third depolarizer being connected to the second optical branch unit side.

3. A current sensor using a sagnac interferometer according to Claim 2 in which the first depolarizer, the second depolarizer and the third depolarizer are formed by polarization maintaining optical fibers, the group delay time

difference between orthogonal components of light occurring in each depolarizer being in the ratio greater than 1:2:4 without regard to the sequence of the first, the second and the third depolarizer.

4. A current sensor using a sagnac interferometer including a light source, an optical directional coupler on which light from the light source impinges, a first polarization filter on which light emitted from the optical directional coupler impinges and which emits a given linearly polarized light, a second optical branch unit for branching light emitted from the first polarization filter into two beams, an optical phase modulator connected to one branch end of the second optical branch unit, a current sensing coil on which a levorotatory light and dextrorotatory light from the other branch end of the second optical branch unit and the optical phase modulator impinge, a first quarter-wave plate inserted between the optical phase modulator and the current sensing coil, and a second quarter-wave plate inserted between the other branch end of the second optical branch unit and the current sensing coil; further comprising

a second depolarizer and a second polarization filter connected in series between the optical phase modulator and the first quarter-wave plate;

and a third depolarizer and a third polarization filter connected in series between the other branch end of the second optical branch unit and the second quarter-wave plate;

the second depolarizer being connected to the optical phase modulator side and the third depolarizer being connected to the second optical branch unit side, the light source being a light source which emits non-polarized light.

5. A current sensor using a sagnac interferometer according to Claim 4 in which the second depolarizer and the third depolarizer are formed by

polarization maintaining optical fibers, and the group delay time differences between the orthogonal components of light occurring in the both depolarizers being in a ratio equal to or greater than 1:2.

6. A current sensor using a sagnac interferometer according to Claim 2, further comprising

a first length adjusting optical fiber coil connected in series between one branch end of the second optical branch unit and the first quarter-wave plate;

and a second length adjusting optical fiber coil connected in series between the other branch end of the second optical branch unit and the second quarter-wave plate;

the both length adjusting optical fiber coils being wound in opposite directions from each other and disposed so that their center axes are substantially aligned on a common rectilinear line.

7. A current sensor using a sagnac interferometer according to Claim 4, further comprising

a first length adjusting optical coil connected in series between one branch end of the second optical branch unit and the first quarter-wave plate;

and a second length adjusting optical fiber coil connected in series between the other branch end of the second optical branch unit and the second quarter-wave plate;

the both length adjusting optical fiber coils being wound in opposite directions from each other and are disposed so that their center axes are substantially aligned on a common rectilinear line.

8. A current sensor using a sagnac interferometer according to Claim 6 or 7, in which the current sensing coil has a center axis which is substantially aligned on a common rectilinear line as the center axes of the first and the

second length adjusting optical fiber coils, the current sensing coil and the both length adjusting optical fiber coils satisfying the following inequality:

$$|R_c \times L_c + R_1 \times L_1 \; R_2 \times L_2| < 5$$

where R_c: a mean radius of the current sensing coil

L_c: optical fiber length of the current sensing coil

R_1: a mean radius of the first length adjusting optical fiber

L_1: optical fiber length of the first length adjusting optical fiber coil

R_2: mean radius of the second length adjusting optical fiber coil

L_2: optical fiber length of the second length adjusting optical fiber coil.

9. A current sensor using a sagnac interferometer according to Claim 6 or 7 in which an optical fiber which forms an optical path between one branch end of the second optical branch unit and the first quarter-wave plate and an optical fiber which defines an optical path between the other branch end of the second optical branch unti and the second quarter-wave plate are formed by single mode optical fibers having cut-off wavelengths which are by at least 100nm longer than the wavelength of the light source.

10. A current sensor using a sagnac interferometer according to one of Claims 1 to 7 in which a separation is made between the optical directional coupler and the second optical branch unit, and the optical directional coupler and the second optical branch unit are connected together by a first optical connector, a second optical connector, and an extended optical fiber which connects between the first optical connector and the second optical connector.

11. A current sensor using a sagnac interferometer according to one of Claims 1 to 7 in which a separation is made between the second branch unit on one hand and the first quarter-wave plate and the second quarter-wave plate on the other hand, and the second branch unit and either quarter-wave

plate are connected together by a first optical connector, a second optical connector and an extended optical fiber which connects between the first optical connector and the second optical connector.